

In the claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (withdrawn) A computer data signal embodied in an electromagnetic waveform for producing a computer readable definition of a photolithographic mask that define a target pattern in a layer to be formed using the photolithographic mask, the computer data signal comprising:

    a source code segment for identifying a plurality of features in the target pattern to be defined using phase shifting, each of the plurality of features comprised of a plurality of edges;

    a source code segment for placing a plurality of shifter shapes in the computer readable definition of the photolithographic mask, the plurality of shifter shapes placed proximate to edges of the plurality of features, wherein the plurality of features includes a first feature having a first edge and a second edge, the first edge adjoining the second edge, and wherein the plurality of shifter shapes includes a first shifter shape placed on the first edge and a second shifter shape placed on the second edge, the first shifter shape and the second shifter shape separated by a minimum distance;

    a source code segment for assigning phase to the plurality of shifter shapes according to phase dependencies and costs to create a plurality of phase shifters; and

    a source code segment for refining the plurality of phase shifters.

2. (withdrawn) The computer data signal of claim 1, wherein the source code segment for assigning phase further comprises a source code segment for branch-and-bound phase assignment.

3. (withdrawn) The computer data signal of claim 1, wherein the source code segment for assigning phase further comprises a source code segment for graph-based phase assignment.

4. (withdrawn) The computer data signal of claim 1, further comprising a source code segment for producing a computer readable definition of a second photolithographic mask, the second photolithographic mask comprising a complimentary mask to be used in conjunction with the photolithographic mask to define the target pattern, the second photolithographic mask defined using the target pattern and the plurality of shifter shapes.

5. (withdrawn) The computer data signal of claim 4, wherein the second photolithographic comprises at least one of a trim mask, a tri-tone mask, an attenuated phase shifting mask, and a binary mask.

6. (withdrawn) The computer data signal of claim 1, wherein the target pattern represented as a computer data signal in a first file format and wherein the computer readable definition of the photolithographic mask represented as a computer data signal in a second file format.

7. (withdrawn) The computer data signal of claim 6, wherein the first file format and the second file format are the same format.

8. (withdrawn) The computer data signal of claim 6, wherein the first file format comprises a GDS-II stream format and the second file format comprises a mask data file in a format suitable for use in mask fabrication machines.

9. (original) A photolithographic mask for defining a target pattern in a layer to be formed using the photolithographic mask, the target pattern comprised of a plurality of features, the photolithographic mask comprising:

a dark field mask having phase shifting openings, the phase shifting openings defined by a process comprising

placing a plurality of shifter shapes proximate to edges of the plurality of features, wherein the plurality of features includes a first feature having a first edge and a second edge, the first edge adjoining the second edge, and wherein the plurality of shifter shapes includes a first shifter shape placed on the first edge and a second shifter shape placed on the second edge, the first shifter shape and the second shifter shape separated by a minimum distance;

assigning phase to the plurality of shifter shapes according to phase dependencies and costs to create a plurality of phase shifters;

refining the plurality of phase shifters; and

producing a computer readable definition of the photolithographic mask.

10. (original) The photolithographic mask of claim 9, wherein the placing further comprises placing the first shifter shape and the second shifter shape such that a cut can be admitted between the first shifter shape and the second shifter shape.

11. (original) The photolithographic mask of claim 10, wherein the cut comprises an opening comprised of a substantially square notch that is intersected at an offset on a forty-five degree ( $45^\circ$ ) angle by a straight neck that ends in a squared off form.

12. (original) The photolithographic mask of claim 10, wherein the cut comprises a minimum mask manufacturing width opening between two adjacent shifter shapes.

13. (original) The photolithographic mask of claim 9, wherein the target pattern characterized by one or more of the following: at least eighty percent (80%) of the non-memory portions of the layer are defined by the photolithographic mask; at least eighty percent (80%) of a part of the floorplan in the layer is defined by the photolithographic mask; at least ninety percent (90%) of the layer is defined by the photolithographic mask; all of the features in the critical path of the layer are defined by the photolithographic mask; all features in the layer except those features that are not phase shifted due to phase conflicts are defined by the photolithographic mask; everything in the layer except test structures are defined by the photolithographic mask; and everything in the layer except dummy structures are defined by the photolithographic mask.

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